# PATENT ABSTRACTS OF JAPAN

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(54) **ENCODER AND DECODER**

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain coded and decoded signals without the power loss of an original signalby providing a bit assigning means and a quantization meansetc.quantizing plural partial band signals generated by a band dividing means based on bit assigning information generated by this assigning means.
SOLUTION: A band dividing part 1 divides an input signal into plural partial bands and outputs a partial band signal. An acoustic sense model part 3 spectrum-analyzes the input signalfurthermore analyzes it based on human acoustic sense characteristic and calculates an evaluation function for executing optimum bit-assigning by a bit assigning part 4 in consideration of a maximum value from a maximum value detection part 2. The part 4 decides optimum bit assignment for each partial band based on this evaluation function. A quantization part 5 normalizes the partial band signal in each partial band from the part 1 by the maximum value from the part 2 for improving quantization efficiency and quantizes and encodes it according to bit assignment from the part 4.

## CLAIMS

[Claim(s)]
[Claim 1]An encoder comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
An auditory model means to conduct spectrum analysis of the above-mentioned input

signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A reference bit quota table which memorizes predetermined reference bit quota information to the above-mentioned partial zone.
Based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA bit quota means to generate bit quota information for quantizing two or more partial zone signals generated by the above-mentioned zone division meansand a quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information generated by the above-mentioned bit quota means.

[Claim 2]An encoder comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
A power calculating means which computes power of two or more partial zone signals generated by the above-mentioned zone division means.
An auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A reference bit quota table which outputs predetermined reference bit quota information to a partial zone based on calculation power of a partial zone of the above-mentioned power calculating meansA bit quota means to generate bit quota information for quantizing two or more partial zone signals generated by the above-mentioned zone division means based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota means.

[Claim 3]An encoder comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
An auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A reference bit quota table which outputs predetermined reference bit quota information over a partial zone based on a spectrum-analysis result of the above-mentioned auditory model means.
A bit quota means to generate bit assignment for quantizing two or more partial zone signals generated by the above-mentioned zone division means based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota means.

[Claim 4]An encoder comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
A maximum value detecting means which detects the maximum of two or more partial zone signals generated by the above-mentioned zone division means.
An auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A reference bit quota table which memorizes predetermined reference bit quota information over a partial zone based on the maximum detected by the above-mentioned maximum value detecting meansA bit quota means to generate bit assignment for quantizing two or more partial zone signals generated by the above-mentioned zone division means based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota means.

[Claim 5]An encoder which is provided with the following and characterized by outputting predetermined reference bit quota information in the above-mentioned reference bit quota means in consideration of a power loss when bit assignment to a partial zone decreases from a result of power tools of analysis of the above 1stand the 2nd power tools of analysis.
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
An auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A reference bit quota table which memorizes predetermined reference bit quota information over the above-mentioned partial zone.
A bit quota means to generate bit assignment for quantizing two or more partial zone signals generated by the above-mentioned zone division means based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota meansA local decoding means to decode coding data quantized by the above-mentioned quantization meansthe 1st power tools of analysis that computes power and spectrum of the above-mentioned input signaland 2nd power tools of analysis that computes power and spectrum of a decoded signal which were decoded by the above-mentioned local decoding means.

[Claim 6]An encoder comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.

An auditory model means to conduct spectrum analysis of the input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A bit quota means to generate bit quota information for quantizing two or more partial zone signals generated by the above-mentioned zone division means.
A quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota meansA power calculating means which asks for power of a partial zone signal of the above-mentioned zone division meansand an adjustment device which adjusts a gain of an input signal corresponding to power of a partial zone searched for by the above-mentioned power calculating means.

[Claim 7]An encoder comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
A maximum value detecting means which detects the maximum of an absolute value of two or more partial zone signals generated by the above-mentioned zone division means.
An auditory model means to conduct spectrum analysis of the input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A bit quota means to generate bit quota information for quantizing two or more partial zone signals generated by the above-mentioned zone division meansA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information defined by the above-mentioned bit quota meansAn adjustment device which adjusts a gain of the maximum detected by the above-mentioned maximum value detecting means corresponding to power of a partial zone searched for by power calculating means which asks for power of a partial zone signal of the above-mentioned zone division meansand the above-mentioned power calculating means.

[Claim 8]In the above-mentioned maximum adjustment devicefrom bit quota information determined by the above-mentioned bit quota meansand power information of a partial zone computed by the above-mentioned power calculating means. The encoder according to claim 7 performing a gain adjustment of the biggest maximum in consideration of a power loss when bit assignment to a partial zone becomes zero among the maximums to each partial zone detected by the above-mentioned maximum value detecting means.
[Claim 9]In the above-mentioned power calculating meansfrom a spectrum analysis result in bit quota information and the above-mentioned auditory model means which were determined by the above-mentioned bit quota means. Claim 6 in consideration of a power loss when bit assignment to a partial zone becomes zero thru/or the encoder according to claim 8.
[Claim 10]From the maximum to a partial zone detected in the above-mentioned power calculating means by bit assignment determined by the above-mentioned bit quota meansand the above-mentioned maximum value detecting means. Claim 6 in consideration of a power loss when bit assignment to a partial zone becomes zero thru/or the encoder according to claim 8.

[Claim 11]In [ have the following and ] the above-mentioned power calculating meansIn [ from a result with power tools of analysis of the above 1stand the 2nd power tools of analysiscompute a power loss when bit quota information over a partial zone becomes zeroand ] the above-mentioned gain-adjustment meansClaim 6 thru/or the encoder according to claim 8 adjusting a gain over an input signal according to a power loss computed by the above-mentioned power calculating means.
A local decoding means to decode coding data generated by the above-mentioned multiplexing means.
1st power tools of analysis that computes power and spectrum of a signal which were inputted.
2nd power tools of analysis that computes power and spectrum of a decoded signal which were decoded by the above-mentioned local decoding means.

[Claim 12]A decoder comprising:
Separating mechanism which separates power informationbit quota informationmaximum informationand sample information which are included in inputted coding data.
An inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample information.
A band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization means.
A gain-adjustment means to perform a gain adjustment of a decoded signal by which band composition was carried out by the above-mentioned band composition means according to power information separated by separating mechanism.

[Claim 13]A decoder comprising:
Separating mechanism which separates power informationbit quota informationmaximum informationand sample information which are included in inputted coding data.
An inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample information.
A band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization means.
A power loss calculating means which computes a power loss over a partial zone from power information from the above-mentioned separation partbit quota informationand maximum informationA maximum adjustment device which performs a gain adjustment of maximum information corresponding to a partial zone separated by the above-mentioned separation part according to a power loss computed by the above-mentioned power loss calculating means.

[Claim 14]A decoder which is provided with the following and characterized by generating noise which applied a lower-limit-of-hearing level in the above-mentioned partial zone signal generating means as a level of a partial zone signal generated to a partial zone whose bit assignment is zero.
Separating mechanism which separates bit quota informationmaximum informationand sample information which are included in inputted coding data.
An inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample information.

A band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization means.
A partial zone signal generating means which bit assignment judges a partial zone which is zero from bit quota information separated by the above-mentioned separating mechanismand generates the partial zone signalA calculating means adding a partial zone signal decoded by the above-mentioned inverse quantization meansand a partial zone signal generated by the above-mentioned partial zone signal generating meansand a band composition means to compound a partial zone signal added by the above-mentioned calculating means to a signal of the original bandwidth.

[Claim 15]In [ have the following and ] the above-mentioned partial zone signal generating meansA decoder generating noise to which bit assignment applied a masking threshold level by a partial zone signal which is not zero from maximum information separated by the above-mentioned separating mechanism as a level of a partial zone signal which bit assignment generates to a partial zone which is zero.
Separating mechanism which separates bit quota informationmaximum informationand sample information which are included in inputted coding data.
An inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample information.
A band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization means.
A partial zone signal generating means which bit assignment judges a partial zone which is zero from bit quota information separated by the above-mentioned separating mechanismand generates the partial zone signalA calculating means adding a partial zone signal decoded by the above-mentioned inverse quantization meansand a partial zone signal generated by the above-mentioned partial zone signal generating meansand a band composition means to compound a partial zone signal added by the above-mentioned calculating means to a signal of the original bandwidth.

[Claim 16]A decoder which is provided with the following and characterized by generating noise which applied a level memorized by the above-mentioned level information memory measure as a level of a partial zone signal generated in the above-mentioned partial zone signal generating means to a partial zone whose bit assignment is zero.
Separating mechanism which separates bit quota informationmaximum informationand sample information which are included in inputted coding data.
An inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample information.
A level information memory measure which memorizes level information of a partial zone signal of the past frame.
A band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization meansA partial zone signal generating means which bit assignment judges a partial zone which is zero from bit quota information separated by the above-mentioned separating mechanismand generates the partial zone signalA calculating means adding a partial zone signal decoded by the above-mentioned inverse quantization meansand a partial zone signal generated by the

above-mentioned partial zone signal generating meansand a band composition means to compound a partial zone signal added by the above-mentioned calculating means to a signal of the original bandwidth.

[Claim 17]A decoder which is provided with the following and characterized by generating noise which applied maximum information separated by the above-mentioned separating mechanism in the above-mentioned partial zone signal generating means as a level of a partial zone signal generated in the above-mentioned partial zone signal generating means to a partial zone whose bit assignment is zero.
Separating mechanism which separates bit quota informationmaximum informationand sample information which are included in inputted coding data.
An inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample information.
A band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization means.
A partial zone signal generating means which bit assignment judges a partial zone which is zero from bit quota information separated by the above-mentioned separating mechanismand generates the partial zone signalA calculating means adding a partial zone signal decoded by the above-mentioned inverse quantization meansand a partial zone signal generated by the above-mentioned partial zone signal generating meansand a band composition means to compound a partial zone signal added by the above-mentioned calculating means to a signal of the original bandwidth.

[Claim 18]In [ have a partial zone signal memory measure which memorizes a partial zone signal of a frame of the past outputted from the above-mentioned adding meansand ] the above-mentioned partial zone signal generating meansClaim 14 which applies a partial zone signal of a frame of the past outputted from the above-mentioned partial zone signal memory measureclaim 15claim 16the decoder according to claim 17.
[Claim 19]Claim 14 which applies a composite signal of a partial zone signal which contains target harmonic content and subharmonic ingredient of a partial zone in the above-mentioned partial zone signal generating means among each partial zone signal outputted from the above-mentioned inverse quantization means thru/or the decoder according to claim 17.

## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention codes an input signal (for exampleaudible signalssuch as a sound and musical tone)and relates to an encoder and a decoder which transmit or carry out record reproductiondecodeand acquire a regenerative signal.
[0002]
[Description of the Prior Art]There are various methods in high efficiency codingsuch as an audible signaland there is a zone part tally item-ized method as one of them. Usuallyalthough what divides the signal on a time-axis into the partial zone of the

plurality still on a time-axis with a filterand is coded is called a zone part tally item-ized methodWhat is called an orthogonal-transformation-encoding method that changes the signal on a time-axis into the signal on a frequency axis (rectangular change)and is divided and coded to two or more partial zones is also a kind of zone part tally item-ized method.

[0003]As a filter for the above-mentioned zone divisiondigital filterssuch as a polyphase filter bank and QMF filterare mentionedfor example. Fast Fourier Transform (FFT)a discrete cosine transform (DCT)etc. are mentioned as orthogonal transformationfor example.

[0004]When coding the sample data for every partial zone divided into two or more partial zonesthe coding by accommodative bit assignment is performed for every predetermined bit distribution or partial zone for every partial zone.

[0005]As such a coding modethere are some which were shownfor example in JP04-177300A and JP05-37396A. Drawing 27 is a figure showing the composition of the above conventional encoders. As for an auditory model part and 4a zone dividing part and 2 are [ a quantizing part and 6 ] multiplexing parts a bit assigning part and 5 a maximum primary detecting element and 3 1.

[0006]Operation of the conventional encoder shown in drawing 27 is explained. In the zone dividing part 1an input signal is divided into two or more partial zonesand the partial zone signal over a certain specific time division is outputted. In coding of an audible signalaccording to human being's aural characteristicit usually divides into the equal bandwidth of 32 pieces. In specific time divisionthe maximum of the absolute value of a partial zone signal is detected for every partial zone in the maximum primary detecting element 2. In the auditory model part 3the valuation function for conducting spectrum analysis of FFT analysis etc.and analyzing an input signal based on human being's aural characteristic to this furtherand performing optimal bit assignment by the bit assigning part 4 in consideration of the maximum from the maximum primary detecting element 2 is computed. The aural characteristics of human being who says here are mainly lower limit of hearing and a masking effect. Lower limit of hearing is a minimum level which can be perceived by human being's acoustic senseand a masking effect is a phenomenon it becomes impossible to perceive the signal of a small level with the signal of a big level. In consideration of these characteristicsa valuation function is computed from the spectrum and the relation of the mask characteristic of an input signal ingredient. There is a difference of the maximum of the signal level in each partial zone and the minimum of the mask characteristic as an example of a valuation function.

[0007]In the bit assigning part 4the optimal bit assignment for each partial zone is determined based on the valuation function from the auditory model part 3. When the difference of the maximum of a signal level and the minimum of the mask characteristic is considered as a valuation functiona bit is assigned one by one from the big partial zone of the difference. When using such a valuation functionand this value serves as negativethe control which makes bit assignment zero in consideration of the efficiency of coding may be added. In the quantizing part 5the partial zone signal of each partial zone from the zone dividing part 1 is normalized at the maximum from the maximum primary detecting element 2in order to raise quantization efficiencyand it quantizes and codes according to the bit assignment from the bit assigning part 4. The multiplexing part 6 multiplexes the maximum information from the maximum primary detecting element

2the bit quota information from the bit assigning part 4and the sample information from the quantizing part 5and outputs them as coding data. In this casewhen the bit assignment to a partial zone is zero because of amount-of-information reductionthe maximum information and sample information over that partial zone are not usually multiplexed.
[0008]Drawing 28 simplifies and expresses the power distribution of a partial zone signal. Drawing 29 shows the situation of the bit assignment assigned by the bit assigning part 4. The information is not transmitted when the bit assignment of each partial zone signal shown in drawing 28 is zero. Therefore the partial zone signal transmitted when the bit assignment shown in drawing 29 is assigned becomes like drawing 30.
[0009]Drawing 31 is a figure showing the composition of the conventional decoder. As for 1an inverse quantization part and 3 are band composition parts a separation part and 2. The inputted coding data is divided into sample informationmaximum informationand bit quota information in the separation part 1. Bit assignment decodes the partial zone signal for every partial zone which is not zero from each informationand bit assignment substitutes the inverse quantization part 2 for a zero signal as a partial zone signal to the partial zone which is zeroand carries out band composition of these partial zone signals to the signal of the original bandwidth in the band composition part 3 at it.
[0010]
[Problem(s) to be Solved by the Invention]In such a conventional encoder and decoderdivide the HARASHIN item into two or more partial zonesand transmission processing of each partial zone signaling information is carried outWhen the bit assigned to a certain partial zone was zerothe partial zone signaling informationfor examplethe above-mentioned maximum informationand sample information will be transmittedandsothe decoded signal compounded after transmission had the problem that power decreased to the HARASHIN item.
[0011]Were made in order that this invention might solve the above technical problemsand transmission of required partial zone signaling information is guaranteedOr when the power for partial zone signal loss is compensated beforehand or compensation etc. carry out power for partial zone signal loss afterwardsit aims at providing the coding decoder which acquires a coding decoded signal without a signal power loss from the HARASHIN item.
[0012]
[Means for Solving the Problem]An encoder concerning claim 1 of this invention is characterized by comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
An auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A reference bit quota table which memorizes predetermined reference bit quota information to the above-mentioned partial zone.
Based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA bit quota means to generate bit quota information for quantizing two or more partial zone signals generated by the above-mentioned zone division meansand a quantization means which quantizes two or more partial zone signals generated by the

above-mentioned zone division means based on bit quota information generated by the above-mentioned bit quota means.

[0013]An encoder concerning claim 2 of this invention is characterized by comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
A power calculating means which computes power of two or more partial zone signals generated by the above-mentioned zone division means.
An auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A reference bit quota table which outputs predetermined reference bit quota information to a partial zone based on calculation power of a partial zone of the above-mentioned power calculating meansA bit quota means to generate bit quota information for quantizing two or more partial zone signals generated by the above-mentioned zone division means based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota means.

[0014]An encoder concerning claim 3 of this invention is characterized by comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
An auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A reference bit quota table which outputs predetermined reference bit quota information over a partial zone based on a spectrum-analysis result of the above-mentioned auditory model means.
A bit quota means to generate bit assignment for quantizing two or more partial zone signals generated by the above-mentioned zone division means based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota means.

[0015]An encoder concerning claim 4 of this invention is characterized by comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
A maximum value detecting means which detects the maximum of two or more partial zone signals generated by the above-mentioned zone division means.
An auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.

A reference bit quota table which memorizes predetermined reference bit quota information over a partial zone based on the maximum detected by the above-mentioned maximum value detecting meansA bit quota means to generate bit assignment for quantizing two or more partial zone signals generated by the above-mentioned zone division means based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota means.

[0016]A zone division means for an encoder concerning claim 5 of this invention to divide an input signal into two or more partial zonesand to generate two or more partial zone signalsAn auditory model means to conduct spectrum analysis of the above-mentioned input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zonesA reference bit quota table which memorizes predetermined reference bit quota information over the above-mentioned partial zoneA bit quota means to generate bit assignment for quantizing two or more partial zone signals generated by the above-mentioned zone division means based on a valuation function computed by reference bit quota information and the above-mentioned auditory model means of the above-mentioned reference bit quota tableA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota meansA local decoding means to decode coding data quantized by the above-mentioned quantization meansIn [ have the 1st power tools of analysis that computes power and spectrum of the above-mentioned input signaland the 2nd power tools of analysis that computes power and spectrum of a decoded signal which were decoded by the above-mentioned local decoding meansand ] the above-mentioned reference bit quota meansFrom a result of power tools of analysis of the above 1stand the 2nd power tools of analysispredetermined reference bit quota information is outputted in consideration of a power loss when bit assignment to a partial zone decreases.
[0017]An encoder concerning claim 6 of this invention is characterized by comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
An auditory model means to conduct spectrum analysis of the input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A bit quota means to generate bit quota information for quantizing two or more partial zone signals generated by the above-mentioned zone division means.
A quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information determined by the above-mentioned bit quota meansA power calculating means which asks for power of a partial zone signal of the above-mentioned zone division meansand an adjustment device which adjusts a gain of an input signal corresponding to power of a partial zone searched for by the above-mentioned power calculating means.

[0018]An encoder concerning claim 7 of this invention is characterized by comprising:
A zone division means to divide an input signal into two or more partial zonesand to generate two or more partial zone signals.
A maximum value detecting means which detects the maximum of an absolute value of two or more partial zone signals generated by the above-mentioned zone division means.
An auditory model means to conduct spectrum analysis of the input signal based on a masking rule of human being's aural characteristicand to compute a valuation function over two or more above-mentioned partial zones.
A bit quota means to generate bit quota information for quantizing two or more partial zone signals generated by the above-mentioned zone division meansA quantization means which quantizes two or more partial zone signals generated by the above-mentioned zone division means based on bit quota information defined by the above-mentioned bit quota meansAn adjustment device which adjusts a gain of the maximum detected by the above-mentioned maximum value detecting means corresponding to power of a partial zone searched for by power calculating means which asks for power of a partial zone signal of the above-mentioned zone division meansand the above-mentioned power calculating means.

[0019]An encoder concerning claim 8 of this invention from bit quota information determined by the above-mentioned bit quota meansand power information of a partial zone computed by the above-mentioned power calculating means. In consideration of a power loss when bit assignment to a partial zone becomes zeroa gain adjustment of the biggest maximum is performed among the maximums to each partial zone detected by the above-mentioned maximum value detecting means.
[0020]An encoder concerning claim 9 of this invention takes into consideration a power loss when bit assignment to a partial zone becomes zero from a spectrum analysis result in bit quota information and the above-mentioned auditory model means which were determined by the above-mentioned bit quota means.
[0021]An encoder concerning claim 10 of this invention takes into consideration a power loss when bit assignment to a partial zone becomes zero from the maximum to a partial zone detected by bit assignment determined by the above-mentioned bit quota meansand the above-mentioned maximum value detecting means.
[0022]A local decoding means by which an encoder concerning claim 11 of this invention decodes coding dataThe 1st power tools of analysis that computes power and spectrum of a signal which were inputtedIn [ have the 2nd power tools of analysis that computes power and spectrum of a decoded signal which were decoded by the above-mentioned local decoding meansand ] the above-mentioned power calculating meansIn [ from a result with power tools of analysis of the above 1stand the 2nd power tools of analysiscompute a power loss when bit quota information over a partial zone becomes zeroand ] the above-mentioned gain-adjustment meansA gain over an input signal is adjusted according to a power loss computed by the above-mentioned power calculating means.
[0023]A decoder concerning claim 12 of this invention is characterized by comprising:
Separating mechanism which separates power informationbit quota informationmaximum informationand sample information which are included in inputted coding data.
An inverse quantization means to decode a partial zone signal from the above-mentioned

bit quota informationmaximum informationand sample information.
A band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization means.
A gain-adjustment means to perform a gain adjustment of a decoded signal by which band composition was carried out by the above-mentioned band composition means according to power information separated by separating mechanism.

[0024]A decoder concerning claim 13 of this invention is characterized by comprising:
Separating mechanism which separates power informationbit quota informationmaximum informationand sample information which are included in inputted coding data.
An inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample information.
A band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization means.
A power loss calculating means which computes a power loss over a partial zone from power information from the above-mentioned separation partbit quota informationand maximum informationA maximum adjustment device which performs a gain adjustment of maximum information corresponding to a partial zone separated by the above-mentioned separation part according to a power loss computed by the above-mentioned power loss calculating means.

[0025]Separating mechanism which separates bit quota informationmaximum informationand sample information which are included in coding data into which a decoder concerning claim 14 of this invention was inputtedAn inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample informationA band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization meansA partial zone signal generating means which bit assignment judges a partial zone which is zero from bit quota information separated by the above-mentioned separating mechanismand generates the partial zone signalA calculating means adding a partial zone signal decoded by the above-mentioned inverse quantization meansand a partial zone signal generated by the above-mentioned partial zone signal generating meansIn [ have a band composition means to compound a partial zone signal added by the above-mentioned calculating means to a signal of the original bandwidthand ] the above-mentioned partial zone signal generating meansAs a level of a partial zone signal which bit assignment generates to a partial zone which is zeronoise which applied a lower-limit-of-hearing level is generated.
[0026]Separating mechanism which separates bit quota informationmaximum informationand sample information which are included in coding data into which a decoder concerning claim 15 of this invention was inputtedAn inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample informationA band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization meansA partial zone signal generating means which bit assignment judges a partial zone which is zero from bit quota information separated by the above-mentioned separating mechanismand generates the partial zone signalA

calculating means adding a partial zone signal decoded by the above-mentioned inverse quantization meansand a partial zone signal generated by the above-mentioned partial zone signal generating meansIn [ have a band composition means to compound a partial zone signal added by the above-mentioned calculating means to a signal of the original bandwidthand ] the above-mentioned partial zone signal generating meansAs a level of a partial zone signal which bit assignment generates to a partial zone which is zerobit assignment generates noise which applied a masking threshold level by a partial zone signal which is not zero from maximum information separated by the above-mentioned separating mechanism.

[0027]Separating mechanism which separates bit quota informationmaximum informationand sample information which are included in coding data into which a decoder concerning claim 16 of this invention was inputtedAn inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample informationA level information memory measure which memorizes level information of a partial zone signal of the past frameA band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization meansA partial zone signal generating means which bit assignment judges a partial zone which is zero from bit quota information separated by the above-mentioned separating mechanismand generates the partial zone signalA calculating means adding a partial zone signal decoded by the above-mentioned inverse quantization meansand a partial zone signal generated by the above-mentioned partial zone signal generating meansIn [ have a band composition means to compound a partial zone signal added by the above-mentioned calculating means to a signal of the original bandwidthand ] the above-mentioned partial zone signal generating meansNoise which applied a level memorized by the above-mentioned level information memory measure as a level of a partial zone signal which bit assignment generates to a partial zone which is zero is generated.

[0028]Separating mechanism which separates bit quota informationmaximum informationand sample information which are included in coding data into which a decoder concerning claim 17 of this invention was inputtedAn inverse quantization means to decode a partial zone signal from the above-mentioned bit quota informationmaximum informationand sample informationA band composition means which carries out band composition of the partial zone signal decoded by the above-mentioned inverse quantization meansA partial zone signal generating means which bit assignment judges a partial zone which is zero from bit quota information separated by the above-mentioned separating mechanismand generates the partial zone signalA calculating means adding a partial zone signal decoded by the above-mentioned inverse quantization meansand a partial zone signal generated by the above-mentioned partial zone signal generating meansIn [ have a band composition means to compound a partial zone signal added by the above-mentioned calculating means to a signal of the original bandwidthand ] the above-mentioned partial zone signal generating meansIn the above-mentioned partial zone signal generating meansnoise which applied maximum information separated by the above-mentioned separating mechanism as a level of a partial zone signal which bit assignment generates to a partial zone which is zero is generated.

[0029]A decoder concerning claim 18 of this invention has a partial zone signal memory

measure which memorizes a partial zone signal of a frame of the past outputted from the above-mentioned adding meansIn the above-mentioned partial zone signal generating meansa partial zone signal of a frame of the past outputted from the above-mentioned partial zone signal memory measure is applied.
[0030]A decoder concerning claim 19 of this invention applies a composite signal of a partial zone signal which contains target harmonic content and subharmonic ingredient of a partial zone among each partial zone signal outputted from the above-mentioned inverse quantization means in the above-mentioned partial zone signal generating means.
[0031]
[Embodiment of the Invention]
an embodiment of the invention -- 1. drawing 1 is shown about the encoder which is an example of this invention. in drawing 1 -- 1 -- as for a bit assigning part and 5a maximum primary detecting element and 3 are [ a multiplexing part and 8 ] reference bit quota tables a quantizing part and 6 an auditory model part and 4 a zone dividing part and 2. 1-6 are the same as that of the above-mentioned conventional example.
[0032]Nextoperation is explained. In the zone dividing part 1an input signal is divided into two or more partial zonesand the partial zone signal over a certain specific time division is outputted. In coding of an audible signalaccording to human being's aural characteristicit usually divides into the equal bandwidth of 32 pieces. In specific time divisionthe maximum of the absolute value of a partial zone signal is detected for every partial zone in the maximum primary detecting element 2. In the auditory model part 3the valuation function for conducting spectrum analysis of FFT analysis etc.and analyzing an input signal based on human being's aural characteristic to this furtherand performing optimal bit assignment by the bit assigning part 4 in consideration of the maximum from the maximum primary detecting element 2 is computed. The aural characteristics of human being who says here are mainly lower limit of hearing and a masking effect. Lower limit of hearing is a minimum level which can be perceived by human being's acoustic senseand a masking effect is a phenomenon it becomes impossible to perceive the signal of a small level with the signal of a big level. In consideration of these characteristicsa valuation function is computed from the spectrum and the relation of the mask characteristic of an input signal ingredient. There is a difference of the maximum of the signal level in each partial zone and the minimum of the mask characteristic as an example of a valuation function. In the bit assigning part 4the optimal bit assignment for each partial zone is determined based on the valuation function from the auditory model part 3. In the quantizing part 5the partial zone signal of each partial zone from the zone dividing part 1 is normalized at the maximum from the maximum primary detecting element 2in order to raise quantization efficiencyand it quantizes and codes according to the bit assignment from the bit assigning part 4. The multiplexing part 6 multiplexes the maximum information from the maximum primary detecting element 2the bit quota information from the bit assigning part 4and the sample information from the quantizing part 5and outputs them as coding data. In this casewhen the bit assignment to a partial zone is zero because of amount-of-information reductionthe maximum information and sample information over that partial zone are not usually multiplexed. In the operation processing of the above coding equipmentwhen quantizing and transmitting a partial zone signalsince the information on a partial zone signal that bit assignment is zero is not transmitted at allit cannot carry out decoding reproduction of the partial zone signal in the

decoder side. Thereforeas for the reproduced decoded signalthe amount of power of the partial zone signal will decrease to the power of the input signal by the side of an encoder. When bit assignment is one or morethe information transmission of partial zone signaling information is guaranteedand power does not decrease. If it furthermore saysbit assignment will be able to prevent reduction of power with at least 1 bitand the bit assignment beyond it will contribute to the improvement of a quantumization noise. The bit assignment from which bit assignment of as opposed to such a partial zone in the reference bit quota table 8 serves as a standard which guarantees power to each partial zone in consideration of the power loss at the time of becoming zero is prepared. For exampleat least one or more bits are assigned to all the partial zones like drawing 2. If the bit quota table of drawing 2 is used to the input signal which has power distribution like drawing 29transmission of all the partial zone signals will be guaranteedthe partial zone signal transmitted will come to be shown in drawing 29and the loss of power will not be generated. The rate that the high-frequency component over the signal component of all the zones occupies or a high-frequency component does not exist at all is very smallWhen charactersuch as power distribution of an input signalis known beforehandto the high regionat least one or more bits are assigned to the zone of zero and others like drawing 3. If the bit quota table of drawing 3 is used to the input signal which has power distribution like drawing 29the partial zone signal with which transmission is guaranteed comes to be shown in drawing 4and although the power of the partial zone signal of zero decreasesbit assignmentThe rate that the decrement all occupies to the power of a zonation region signal is smalland there is little influence. In the bit assigning part 4floor bit assignment for a power guarantee is first performed beforehand based on the reference bit quota table 8. Nextbased on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of such a floorbit assignment is further performed to each partial zone for the improvement of a quantumization noise. Since one or more bits are assigned to the partial zone whose bit assignment is zero depending on the value of a valuation function on a reference bit quota table at this timeit will be further guaranteed about power. The loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be prevented. In the encoder constituted as mentioned above in shortA zone division means generates a partial zone signal by dividing an input signal into two or more partial zonesA maximum value detecting means detects the absolute value of a partial zone signaland it an auditory model meansSpectrum analysis of the input signal is conducted based on the masking rule of human being's aural characteristicAfter referring to the reference bit quota table where reference bit assignment at its minimum was beforehand prepared in consideration of the power loss when the valuation function over two or more partial zones is computed and bit assignment of as opposed to a partial zone in a bit quota means becomes zeroFinal bit assignment is performed based on a valuation functiona quantization means quantizes two or more partial zone signals based on bit assignmentand a multiplexing means multiplexes and outputs bit quota informationmaximum detection informationand sample information.

[0033]an embodiment of the invention -- 2. drawing 5 is shown about the encoder which is an example of this invention. in drawing 5 -- 1 -- a zone dividing part and 2 -- as for a quantizing part and 6an auditory model part and 4 are [ a reference bit quota part and 10 ] power calculation parts a multiplexing part and 9 a bit assigning part and 5 a maximum

primary detecting element and 3. 1-6 are the same as that of the above-mentioned conventional example.

[0034]Nextoperation is explained. In the zone dividing part 1an input signal is divided into two or more partial zonesand the partial zone signal over a certain specific time division is outputted. In coding of an audible signalaccording to human being's aural characteristicit usually divides into the equal bandwidth of 32 pieces. In specific time divisionthe maximum of the absolute value of a partial zone signal is detected for every partial zone in the maximum primary detecting element 2. In the auditory model part 3the valuation function for conducting spectrum analysis of FFT analysis etc.and analyzing an input signal based on human being's aural characteristic to this furtherand performing optimal bit assignment by the bit assigning part 4 in consideration of the maximum from the maximum primary detecting element 2 is computed. The aural characteristics of human being who says here are mainly lower limit of hearing and a masking effect. Lower limit of hearing is a minimum level which can be perceived by human being's acoustic senseand a masking effect is a phenomenon it becomes impossible to perceive the signal of a small level with the signal of a big level. In consideration of these characteristicsa valuation function is computed from the spectrum and the relation of the mask characteristic of an input signal ingredient. There is a difference of the maximum of the signal level in each partial zone and the minimum of the mask characteristic as an example of a valuation function. In the bit assigning part 4the optimal bit assignment for each partial zone is determined based on the valuation function from the auditory model part 3. In the quantizing part 5the partial zone signal of each partial zone from the zone dividing part 1 is normalized at the maximum from the maximum primary detecting element 2in order to raise quantization efficiencyand it quantizes and codes according to the bit assignment from the bit assigning part 4. The multiplexing part 6 multiplexes the maximum information from the maximum primary detecting element 2the bit quota information from the bit assigning part 4and the sample information from the quantizing part 5and outputs them as coding data. In this casewhen the bit assignment to a partial zone is zero because of amount-of-information reductionthe maximum information and sample information over that partial zone are not usually multiplexed. In the operation processing of the above encoderwhen quantizing and transmitting a partial zone signalsince the information on a partial zone signal that bit assignment is zero is not transmitted at allit cannot carry out decoding reproduction of the partial zone signal in the decoder side. Thereforeas for the reproduced decoded signalthe amount of power of the partial zone signal will decrease to the power of the input signal by the side of an encoder. When bit assignment is one or morethe information transmission of partial zone signaling information is guaranteedand power does not decrease. If it furthermore saysbit assignment will be able to prevent reduction of power with at least 1 bitand the bit assignment beyond it will contribute to the improvement of a quantumization noise. The bit assignment from which bit assignment of as opposed to such a partial zone in the reference bit quota part 9 serves as a standard which guarantees power to each partial zone in consideration of the power loss at the time of becoming zero is prepared. For examplleat least one or more bits are assigned to all the partial zones like drawing 2. If the bit quota table of drawing 2 is used to the input signal which has power distribution like drawing 29transmission of all the partial zone signals will be guaranteedthe partial zone signal transmitted will come to be shown in drawing 29and the loss of power will not be

generated. The rate that the high-frequency component over the signal component of all the zones occupies or a high-frequency component does not exist at all is very smallWhen charactersuch as power distribution of an input signalis known beforehandto the high regionat least one or more bits are assigned to the zone of zero and others like drawing 3. If the bit assigning part 9 of drawing 3 is used to the input signal which has power distribution like drawing 29the partial zone signal with which transmission is guaranteed comes to be shown in drawing 4and although the power of the partial zone signal of zero decreasesbit assignmentThe decrement has the small rate of all occupying to the power of a zonation region signaland there is little influence. In the bit assigning part 4floor bit assignment for a power guarantee is first performed beforehand based on the reference bit quota part 9. Nextbased on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of such a floorbit assignment is further performed to each partial zone for the improvement of a quantumization noise. Since one or more bits are assigned to the partial zone whose bit assignment is zero depending on the value of a valuation function on a reference bit quota table at this timeit will be further guaranteed about power. The loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be prevented.

[0035]Nextthe power calculation part 10 computes power from the partial zone signal of each partial zone outputted from the zone dividing part 1 as power to each partial zone. The reference bit quota part 9 takes into consideration a power loss when the bit assignment to a partial zone becomes zero from the computed result of the power of each partial zone in the power calculation part 10. The method of the consideration is as having stated above. As the resultat least one or more bits are assignedfor example to all the partial zones. Or a high-frequency component did not exist at allwhen it is judged that the rate that the high-frequency component over the signal component of all the zones occupies is very smallto a high regionat least one or more bits are assigned to the zone of zero and others. In the bit assigning part 4bit assignment is further performed to each partial zone based on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of the floor for the power guarantee assigned by the reference bit quota part 9 for the improvement of a quantumization noise. This can protect the loss of the partial zone signal component by the bit assignment to a partial zone serving as zero corresponding to change of an input signal. In the reference bit quota part 9arbitrary reference bit assignment may not be performed from a power computed resultbut it may choose from two or more reference bit quota tables currently prepared beforehand. In shorta zone division means generates a partial zone signal by dividing an input signal into two or more partial zonesA power calculating means computes the power of a partial zone signaland it a maximum value detecting meansDetect the maximum of the absolute value of a partial zone signaland an auditory model means conducts spectrum analysis of the input signal based on the masking rule of human being's aural characteristicCompute the valuation function over two or more partial zonesand a power loss when the bit assignment to a partial zone becomes zero is taken into consideration from the power information of the partial zone signal with which a reference bit quota means is outputted from a zone division meansPerform bit assignment of a floor and a bit quota means adds to reference bit assignment at its minimumFinal bit assignment is performed based on a valuation functiona quantization means quantizes two or more partial zone signals based on bit assignmentand a multiplexing means

multiplexes and outputs bit quota informationmaximum detection informationand sample information.

[0036]an embodiment of the invention -- 3. drawing 6 is shown about the encoder which is an example of this invention. in drawing 6 -- 1 -- as for a bit assigning part and 5a maximum primary detecting element and 3 are [ a multiplexing part and 9 ] reference bit quota parts a quantizing part and 6 an auditory model part and 4 a zone dividing part and 2. 1-6 are the same as that of the above-mentioned conventional example.

[0037]Nextoperation is explained. In the zone dividing part 1an input signal is divided into two or more partial zonesand the partial zone signal over a certain specific time division is outputted. In coding of an audible signalaccording to human being's aural characteristicit usually divides into the equal bandwidth of 32 pieces. In specific time divisionthe maximum of the absolute value of a partial zone signal is detected for every partial zone in the maximum primary detecting element 2. In the auditory model part 3the valuation function for conducting spectrum analysis of FFT analysis etc.and analyzing an input signal based on human being's aural characteristic to this furtherand performing optimal bit assignment by the bit assigning part 4 in consideration of the maximum from the maximum primary detecting element 2 is computed. The aural characteristics of human being who says here are mainly lower limit of hearing and a masking effect. Lower limit of hearing is a minimum level which can be perceived by human being's acoustic senseand a masking effect is a phenomenon it becomes impossible to perceive the signal of a small level with the signal of a big level. In consideration of these characteristicsa valuation function is computed from the spectrum and the relation of the mask characteristic of an input signal ingredient. There is a difference of the maximum of the signal level in each partial zone and the minimum of the mask characteristic as an example of a valuation function. In the bit assigning part 4the optimal bit assignment for each partial zone is determined based on the valuation function from the auditory model part 3. In the quantizing part 5the partial zone signal of each partial zone from the zone dividing part 1 is normalized at the maximum from the maximum primary detecting element 2in order to raise quantization efficiencyand it quantizes and codes according to the bit assignment from the bit assigning part 4. The multiplexing part 6 multiplexes the maximum information from the maximum primary detecting element 2the bit quota information from the bit assigning part 4and the sample information from the quantizing part 5and outputs them as coding data. In this casewhen the bit assignment to a partial zone is zero because of amount-of-information reductionthe maximum information and sample information over that partial zone are not usually multiplexed. In the operation processing of the above encoderwhen quantizing and transmitting a partial zone signalsince the information on a partial zone signal that bit assignment is zero is not transmitted at allit cannot carry out decoding reproduction of the partial zone signal in the decoder side. Thereforeas for the reproduced decoded signalthe amount of power of the partial zone signal will decrease to the power of the input signal by the side of an encoder. When bit assignment is one or morethe information transmission of partial zone signaling information is guaranteedand power does not decrease. If it furthermore saysbit assignment will be able to prevent reduction of power with at least 1 bitand the bit assignment beyond it will contribute to the improvement of a quantumization noise. The bit assignment from which bit assignment of as opposed to such a partial zone in the reference bit quota part 9 serves as a standard which guarantees power to each partial

zone in consideration of the power loss at the time of becoming zero is prepared. For exampleat least one or more bits are assigned to all the partial zones like drawing 2. If the bit quota table of drawing 2 is used to the input signal which has power distribution like drawing 29transmission of all the partial zone signals will be guaranteedthe partial zone signal transmitted will come to be shown in drawing 29and the loss of power will not be generated. The rate that the high-frequency component over the signal component of all the zones occupies or a high-frequency component does not exist at all is very smallWhen charactersuch as power distribution of an input signalis known beforehandto the high regionat least one or more bits are assigned to the zone of zero and others like drawing 3. If the bit assigning part 9 of drawing 3 is used to the input signal which has power distribution like drawing 29the partial zone signal with which transmission is guaranteed comes to be shown in drawing 4and although the power of the partial zone signal of zero decreasesbit assignmentThe rate that the decrement all occupies to the power of a zonation region signal is smalland there is little influence. In the bit assigning part 4bit assignment of the floor for a power guarantee is first performed beforehand based on the reference bit quota part 9. Nextbased on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of such a floorbit assignment is further performed to each partial zone for the improvement of a quantumization noise. Since one or more bits are assigned to the partial zone whose bit assignment is zero depending on the value of a valuation function on a reference bit quota table at this timeit will be further guaranteed about power. The loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be prevented.

[0038]Belowthe reference bit quota part 9 is explained in detail. The reference bit quota part 9 computes the power of each partial zone from the result of the spectrum analysis in the auditory model part 3and takes into consideration a power loss when the bit assignment to a partial zone becomes zero. The method of the consideration is as having stated above. As the resultat least one or more bits are assignedfor example to all the partial zones. Or a high-frequency component did not exist at allwhen it is judged that the rate that the high-frequency component over the signal component of all the zones occupies is very smallto a high regionat least one or more bits are assigned to the zone of zero and others. In the bit assigning part 4bit assignment is further performed to each partial zone based on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of the floor for the power guarantee assigned by the reference bit quota part 9 for the improvement of a quantumization noise. This can protect the loss of the partial zone signal component by the bit assignment to a partial zone serving as zero corresponding to change of an input signal. In the reference bit quota part 9arbitrary reference bit assignment may not be performed but it may choose from two or more reference bit quota tables which exist above and which are prepared beforehand. In shorta zone division means generates a partial zone signal by dividing an input signal into two or more partial zonesA power calculating means computes the power of a partial zone signaland it a maximum value detecting meansDetect the maximum of the absolute valuc of a partial zone signaland an auditory model means conducts spectrum analysis of the input signal based on the masking rule of human being's aural characteristicCompute the valuation function over two or more partial zonesand a power loss when the bit assignment to a partial zone becomes zero is taken

into consideration from a spectrum analysis result [ in / in a reference bit quota means / an auditory model means ]Perform bit assignment of a floor and a bit quota means adds to reference bit assignment at its minimumFinal bit assignment is performed based on a valuation functiona quantization means quantizes two or more partial zone signals based on bit assignmentand a multiplexing means multiplexes and outputs bit quota informationmaximum detection informationand sample information.

[0039]an embodiment of the invention -- 4. drawing 7 is shown about the encoder which is one example of this invention. In drawing 71-6 are the same as that of the above-mentioned conventional exampleand they omit the explanation. 9 is a reference bit quota part.

[0040]Nextoperation is explained. In the zone dividing part 1an input signal is divided into two or more partial zonesand the partial zone signal over a certain specific time division is outputted. In coding of an audible signalaccording to human being's aural characteristicit usually divides into the equal bandwidth of 32 pieces. In specific time divisionthe maximum of the absolute value of a partial zone signal is detected for every partial zone in the maximum primary detecting element 2. In the auditory model part 3the valuation function for conducting spectrum analysis of FFT analysis etc.and analyzing an input signal based on human being's aural characteristic to this furtherand performing optimal bit assignment by the bit assigning part 4 in consideration of the maximum from the maximum primary detecting element 2 is computed. The aural characteristics of human being who says here are mainly lower limit of hearing and a masking effect. Lower limit of hearing is a minimum level which can be perceived by human being's acoustic senseand a masking effect is a phenomenon it becomes impossible to perceive the signal of a small level with the signal of a big level. In consideration of these characteristicsa valuation function is computed from the spectrum and the relation of the mask characteristic of an input signal ingredient. There is a difference of the maximum of the signal level in each partial zone and the minimum of the mask characteristic as an example of a valuation function. In the bit assigning part 4the optimal bit assignment for each partial zone is determined based on the valuation function from the auditory model part 3. In the quantizing part 5the partial zone signal of each partial zone from the zone dividing part 1 is normalized at the maximum from the maximum primary detecting element 2in order to raise quantization efficiencyand it quantizes and codes according to the bit assignment from the bit assigning part 4. The multiplexing part 6 multiplexes the maximum information from the maximum primary detecting element 2the bit quota information from the bit assigning part 4and the sample information from the quantizing part 5and outputs them as coding data. In this casewhen the bit assignment to a partial zone is zero because of amount-of-information reductionthe maximum information and sample information over that partial zone are not usually multiplexed. In the operation processing of the above encoderwhen quantizing and transmitting a partial zone signalsince the information on a partial zone signal that bit assignment is zero is not transmitted at allit cannot carry out decoding reproduction of the partial zone signal in the decoder side. Thereforeas for the reproduced decoded signalthe amount of power of the partial zone signal will decrease to the power of the input signal by the side of an encoder. When bit assignment is one or morethe information transmission of partial zone signaling information is guaranteedand power does not decrease. If it furthermore saysbit assignment will be able to prevent reduction of power with at least 1 bitand the bit

assignment beyond it will contribute to the improvement of a quantumization noise. The bit assignment from which bit assignment of as opposed to such a partial zone in the reference bit quota part 9 serves as a standard which guarantees power to each partial zone in consideration of the power loss at the time of becoming zero is prepared. For exampleat least one or more bits are assigned to all the partial zones like drawing 2. If the bit assigning part of drawing 2 is used to the input signal which has power distribution like drawing 29transmission of all the partial zone signals will be guaranteedthe partial zone signal transmitted will come to be shown in drawing 29and the loss of power will not be generated. The rate that the high-frequency component over the signal component of all the zones occupies or a high-frequency component does not exist at all is very smallWhen charactersuch as power distribution of an input signalis known beforehandto the high regionat least one or more bits are assigned to the zone of zero and others like drawing 3. If the bit quota table of drawing 3 is used to the input signal which has power distribution like drawing 29the partial zone signal with which transmission is guaranteed comes to be shown in drawing 4and although the power of the partial zone signal of zero decreasesbit assignmentThe rate that the decrement all occupies to the power of a zonation region signal is smalland there is little influence. In the bit assigning part 4bit assignment of the floor for a power guarantee is first performed beforehand based on the reference bit quota part 9. Nextbased on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of such a floorbit assignment is further performed to each partial zone for the improvement of a quantumization noise. Since one or more bits are assigned to the partial zone whose bit assignment is zero depending on the value of a valuation function on a reference bit quota table at this timeit will be further guaranteed about power. The loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be prevented.

[0041]Belowthe reference bit quota part 9 is explained in detail. The reference bit quota part 9 computes the power of each partial zone from the maximum of the absolute value of the sample data of each partial zone outputted from the maximum primary detecting element 2and takes into consideration a power loss when the bit assignment to a partial zone becomes zero. The method of the consideration is as having stated above. As the resultat least one or more bits are assignedfor example to all the partial zones. Or a high-frequency component did not exist at allwhen it is judged that the rate that the high-frequency component over the signal component of all the zones occupies is very smallto a high regionat least one or more bits are assigned to the zone of zero and others. In the bit assigning part 4bit assignment is further performed to each partial zone based on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of the floor for the power guarantee assigned by the reference bit quota part 9 for the improvement of a quantumization noise. This can protect the loss of the partial zone signal component by the bit assignment to a partial zone serving as zero corresponding to change of an input signal. In the reference bit quota part 9arbitrary reference bit assignment may not be performed from a power computed resultbut it may choose from two or more reference bit quota tables currently prepared beforehand. In shorta zone division means generates a partial zone signal by dividing an input signal into two or more partial zonesA power calculating means computes the power of a partial zone signaland it a maximum value detecting meansDetect the maximum of the absolute value of a partial zone signaland an auditory model means conducts spectrum analysis of

the input signal based on the masking rule of human being's aural characteristicCompute the valuation function over two or more partial zonesand a power loss when the bit assignment to a partial zone becomes zero is taken into consideration from the size of the maximum [ in / in a reference bit quota means / a maximum value detecting means ]Perform bit assignment of a floor and a bit quota means adds to reference bit assignment at its minimumFinal bit assignment is performed based on a valuation functiona quantization means quantizes two or more partial zone signals based on bit assignmentand a multiplexing means multiplexes and outputs bit quota informationmaximum detection informationand sample information.

[0042]an embodiment of the invention -- 5. drawing 8 is shown about the encoder which is one example of this invention. In drawing 81-6 are the same as that of the above-mentioned conventional exampleand they omit the explanation. As for 9a local decoding sectionand 12 and 13 are power analyzor a reference bit quota part and 11.

[0043]Nextoperation is explained. In the zone dividing part 1an input signal is divided into two or more partial zonesand the partial zone signal over a certain specific time division is outputted. In coding of an audible signalaccording to human being's aural characteristicit usually divides into the equal bandwidth of 32 pieces. In specific time divisionthe maximum of the absolute value of a partial zone signal is detected for every partial zone in the maximum primary detecting element 2. In the auditory model part 3the valuation function for conducting spectrum analysis of FFT analysis etc.and analyzing an input signal based on human being's aural characteristic to this furtherand performing optimal bit assignment by the bit assigning part 4 in consideration of the maximum from the maximum primary detecting element 2 is computed. The aural characteristics of human being who says here are mainly lower limit of hearing and a masking effect. Lower limit of hearing is a minimum level which can be perceived by human being's acoustic senseand a masking effect is a phenomenon it becomes impossible to perceive the signal of a small level with the signal of a big level. In consideration of these characteristicsa valuation function is computed from the spectrum and the relation of the mask characteristic of an input signal ingredient. There is a difference of the maximum of the signal level in each partial zone and the minimum of the mask characteristic as an example of a valuation function. In the bit assigning part 4the optimal bit assignment for each partial zone is determined based on the valuation function from the auditory model part 3. In the quantizing part 5the partial zone signal of each partial zone from the zone dividing part 1 is normalized at the maximum from the maximum primary detecting element 2in order to raise quantization efficiencyand it quantizes and codes according to the bit assignment from the bit assigning part 4. The multiplexing part 6 multiplexes the maximum information from the maximum primary detecting element 2the bit quota information from the bit assigning part 4and the sample information from the quantizing part 5and outputs them as coding data. In this casewhen the bit assignment to a partial zone is zero because of amount-of-information reductionthe maximum information and sample information over that partial zone are not usually multiplexed. In the operation processing of the above encoderwhen quantizing and transmitting a partial zone signalsince the information on a partial zone signal that bit assignment is zero is not transmitted at allit cannot carry out decoding reproduction of the partial zone signal in the decoder side. Thereforeas for the reproduced decoded signalthe amount of power of the partial zone signal will decrease to the power of the input signal by the side of an encoder.

When bit assignment is one or morethe information transmission of partial zone signaling information is guaranteedand power does not decrease. If it furthermore saysbit assignment will be able to prevent reduction of power with at least 1 bitand the bit assignment beyond it will contribute to the improvement of a quantumization noise. The bit assignment from which bit assignment of as opposed to such a partial zone in the reference bit quota part 9 serves as a standard which guarantees power to each partial zone in consideration of the power loss at the time of becoming zero is prepared. For exampleat least one or more bits are assigned to all the partial zones like drawing 2. If the bit assigning part 9 of drawing 2 is used to the input signal which has power distribution like drawing 29transmission of all the partial zone signals will be guaranteedthe partial zone signal transmitted will come to be shown in drawing 29and the loss of power will not be generated. The rate that the high-frequency component over the signal component of all the zones occupies or a high-frequency component does not exist at all is very smallWhen charactersuch as power distribution of an input signalis known beforehandto the high regionat least one or more bits are assigned to the zone of zero and others like drawing 3. If the bit assigning part 9 of drawing 3 is used to the input signal which has power distribution like drawing 29the partial zone signal with which transmission is guaranteed comes to be shown in drawing 4and although the power of the partial zone signal of zero decreasesbit assignmentThe decrement has the small rate of all occupying to the power of a zonation region signaland there is little influence. In the bit assigning part 4floor bit assignment for a power guarantee is first performed beforehand based on the reference bit quota part 9. Nextbased on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of such a floorbit assignment is further performed to each partial zone for the improvement of a quantumization noise. Since one or more bits are assigned to the partial zone whose bit assignment is zero depending on the value of a valuation function on a reference bit quota table at this timeit will be further guaranteed about power. The loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be prevented.

[0044]Nextthe bit assigning part 4 once performs bit assignment to each partial zone based on the valuation function outputted from the auditory model part 3. In the quantizing part 5quantization is performed based on this bit assignmentand a variety of information multiplexes in the multiplexing part 6. The local decoding part 11 is the same composition as the decoder shown in a conventional exampleand operates the order of a foul trick of processing with an encoderi.e.separation of coding datainverse quantizationband compositionetc. The local decoding part 11 inputs the coding data outputted from the multiplexing part 6processes the pointand outputs a decoded signal. The 1st power analyzor 12 computes the power and spectrum of an input HARASHIN item which are inputted into an encoderand the 2nd power analyzor 13 computes the power and spectrum of a decoded signal which are outputted from the local decoding part 11. The reference bit quota part 9 takes the loss of the power in coding into consideration from the power analysis result outputted from the 1st power analyzor 12 and the 2nd power analyzor 13. The method of the consideration is as having stated above. In order to prevent the loss of power as the resultat least one or more bits are assignedfor example to all the partial zones. Or a high-frequency component did not exist at allwhen it is judged that the rate that the high-frequency component over the signal component of all the zones occupies is very smallto a high regionat least one or more bits are assigned to the

zone of zero and others. In the bit assigning part 4bit assignment is again performed to each partial zone based on the valuation function which is outputted from the auditory model part 3 in addition to bit assignment of the floor for the power guarantee assigned by the reference bit quota part 9 for the improvement of a quantumization noise. This can protect the loss of the partial zone signal component by the bit assignment to a partial zone serving as zero corresponding to change of an input signal. In the reference bit quota part 9arbitrary reference bit assignment may not be performed from a power computed resultbut it may choose from two or more reference bit quota tables currently prepared beforehand. In shorta zone division means generates a partial zone signal by dividing an input signal into two or more partial zones againA power calculating means computes the power of a partial zone signaland it a maximum value detecting meansDetect the maximum of the absolute value of a partial zone signaland an auditory model means conducts spectrum analysis of the input signal based on the masking rule of human being's aural characteristicCompute the valuation function over two or more partial zonesand a power loss when bit assignment of as opposed to a partial zone in a reference bit quota means becomes zero is taken into consideration from the power analysis result of an input signal and a decoded signalPerform bit assignment of a floor and a bit quota means adds to reference bit assignment at its minimumBased on a valuation functionperform final bit assignmentand a quantization means quantizes two or more partial zone signals based on bit assignmentA multiplexing means multiplexes and outputs bit quota informationmaximum detection informationand sample informationA local decoding machine generates a decoded signalthe 1st power tools of analysis compute the power and spectrum of an input signaland the 2nd power tools of analysis compute the power and spectrum of a decoded signal.

[0045]an embodiment of the invention -- 6. drawing 9 is shown about the encoder which is an example of this invention. In drawing 91-6 are the same as that of the above-mentioned conventional exampleand they omit the explanation. 14 is a power loss calculation part and 15 is a gain adjustment part.

[0046]Nextoperation is explained. In the zone dividing part 1an input signal is divided into two or more partial zonesand the partial zone signal over a certain specific time division is outputted. In coding of an audible signalaccording to human being's aural characteristicit usually divides into the equal bandwidth of 32 pieces. In specific time divisionthe maximum of the absolute value of a partial zone signal is detected for every partial zone in the maximum primary detecting element 2. In the auditory model part 3the valuation function for conducting spectrum analysis of FFT analysis etc.and analyzing an input signal based on human being's aural characteristic to this furtherand performing optimal bit assignment by the bit assigning part 4 in consideration of the maximum from the maximum primary detecting element 2 is computed. The aural characteristics of human being who says here are mainly lower limit of hearing and a masking effect. Lower limit of hearing is a minimum level which can be perceived by human being's acoustic senseand a masking effect is a phenomenon it becomes impossible to perceive the signal of a small level with the signal of a big level. In consideration of these characteristicsa valuation function is computed from the spectrum and the relation of the mask characteristic of an input signal ingredient. There is a difference of the maximum of the signal level in each partial zone and the minimum of the mask characteristic as an example of a valuation function. In the bit assigning part 4the optimal bit assignment for

each partial zone is determined based on the valuation function from the auditory model part 3. In the quantizing part 5the partial zone signal of each partial zone from the zone dividing part 1 is normalized at the maximum from the maximum primary detecting element 2in order to raise quantization efficiencyand it quantizes and codes according to the bit assignment from the bit assigning part 4. The multiplexing part 6 multiplexes the maximum information from the maximum primary detecting element 2the bit quota information from the bit assigning part 4and the sample information from the quantizing part 5and outputs them as coding data. In this casewhen the bit assignment to a partial zone is zero because of amount-of-information reductionthe maximum information and sample information over that partial zone are not usually multiplexed. In the operation processing of the above encoderwhen quantizing and transmitting a partial zone signalsince the information on a partial zone signal that bit assignment is zero is not transmitted at allit cannot carry out decoding reproduction of the partial zone signal in the decoder side. Thereforeas for the reproduced decoded signalthe amount of power of the partial zone signal will decrease to the power of the input signal by the side of an encoder. When bit assignment is one or morethe information transmission of partial zone signaling information is guaranteedand power does not decrease. If it furthermore saysbit assignment will be able to prevent reduction of power with at least 1 bitand the bit assignment beyond it will contribute to the improvement of a quantumization noise. Nextthe zone dividing part 1the maximum primary detecting element 2the auditory model part 3and the bit assigning part 4 so once process to an input signal. The power loss calculation part 14 computes the power of a partial zone signal to the partial zone signal of each partial zone outputted from the zone dividing part 1It distinguishes whether the bit assignment to each partial zone is zero from the bit assignment simultaneously determined by the bit assigning part 4and bit assignment computes the sum total of the power of the partial zone which is zero. Drawing 10 is a situation of the power of a partial zone signal. The slash part in a figure expresses the power of the partial zone from which bit assignment became zeroand this serves as a power loss. The gain adjustment part 15 adjusts the gain of an input signal towards compensating the loss according to the power computed by the power loss calculation part 14. The usual processing is performed to the input signal adjusted by this gain adjustment part 15 after that. Since the input signal in this case has performed the gain adjustmentpower is increasing to the level in which the power of the partial zone signal in the power loss calculation part 14 is shown by the dotted line in drawing 10. This dotted-line portion is equal to the power of a shadow areaand the loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be beforehand compensated with the encoder side. In shorta zone division means generates a partial zone signal by dividing an input signal into two or more partial zonesA maximum value detecting means detects the maximum of the absolute value of a partial zone signaland it an auditory model meansBased on the masking rule of human being's aural characteristicconduct spectrum analysis of the input signalcompute the valuation function over two or more partial zonesand a bit quota means as bit assignment for quantizing two or more partial zone signalsBased on a valuation functionperform bit assignmentand a quantization means quantizes two or more partial zone signals based on bit assignmentA multiplexing means multiplexes and outputs bit quota informationmaximum detection informationand sample informationFrom the bit assignment by the power and the bit

quota means of a partial zone signal which a power loss calculating means is outputted from a zone division meansa power loss when the bit assignment to a partial zone becomes zero is computedand a gain adjustment part performs the gain adjustment of an input signal according to a power loss.

[0047]an embodiment of the invention -- 7. drawing 11 is shown about the encoder which is one example of this invention. In drawing 111-6 are the same as that of the above-mentioned conventional exampleand they omit the explanation. 14 is a power loss calculation part and 16 is a maximum controller. Nextoperation is explained.

[0048]Nextoperation is explained. In the zone dividing part 1an input signal is divided into two or more partial zonesand the partial zone signal over a certain specific time division is outputted. In coding of an audible signalaccording to human being's aural characteristicit usually divides into the equal bandwidth of 32 pieces. In specific time divisionthe maximum of the absolute value of a partial zone signal is detected for every partial zone in the maximum primary detecting element 2. In the auditory model part 3the valuation function for conducting spectrum analysis of FFT analysis etc.and analyzing an input signal based on human being's aural characteristic to this furtherand performing optimal bit assignment by the bit assigning part 4 in consideration of the maximum from the maximum primary detecting element 2 is computed. The aural characteristics of human being who says here are mainly lower limit of hearing and a masking effect. Lower limit of hearing is a minimum level which can be perceived by human being's acoustic senseand a masking effect is a phenomenon it becomes impossible to perceive the signal of a small level with the signal of a big level. In consideration of these characteristicsa valuation function is computed from the spectrum and the relation of the mask characteristic of an input signal ingredient. There is a difference of the maximum of the signal level in each partial zone and the minimum of the mask characteristic as an example of a valuation function. In the bit assigning part 4the optimal bit assignment for each partial zone is determined based on the valuation function from the auditory model part 3. In the quantizing part 5the partial zone signal of each partial zone from the zone dividing part 1 is normalized at the maximum from the maximum primary detecting element 2in order to raise quantization efficiencyand it quantizes and codes according to the bit assignment from the bit assigning part 4. The multiplexing part 6 multiplexes the maximum information from the maximum primary detecting element 2the bit quota information from the bit assigning part 4and the sample information from the quantizing part 5and outputs them as coding data. In this casewhen the bit assignment to a partial zone is zero because of amount-of-information reductionthe maximum information and sample information over that partial zone arc not usually multiplexed. In the operation processing of the above encoderwhen quantizing and transmitting a partial zone signalsince the information on a partial zone signal that bit assignment is zero is not transmitted at allit cannot carry out decoding reproduction of the partial zone signal in the decoder side. Thereforeas for the reproduced decoded signalthe amount of power of the partial zone signal will decrease to the power of the input signal by the side of an encoder. When bit assignment is one or morethe information transmission of partial zone signaling information is guaranteedand power does not decrease. If it furthermore saysbit assignment will be able to prevent reduction of power with at least 1 bitand the bit assignment beyond it will contribute to the improvement of a quantumization noise. The power loss calculation part 14 computes the power of a partial zone signal to the partial

zone signal of each partial zone outputted from the zone dividing part 11t distinguishes whether the bit assignment to each partial zone is zero from the bit assignment simultaneously determined by the bit assigning part 4and bit assignment computes the sum total of the power of the partial zone which is zero. This is the power loss by bit assignment being zero. The maximum controller 16 performs the gain adjustment of the maximum to all the partial zones detected by the maximum primary detecting element 2 towards compensating the loss according to the power loss computed by the power loss calculation part 14. To all the partial zonesthis gain adjustment may be an equal or may make weighting a gain. In the quantizing part 5since the maximum which normalization is performed using the maximum outputted from the maximum primary detecting element 2and is outputted from the maximum controller 16 as maximum information transmitted and by which the gain adjustment was carried out is usedwhen performing reverse normalization by the decoder sidea gain will be given to a partial zone signal. The situation is shown in drawing 12. After normalizing a certain partial zone signal at the maximumif a gain adjustment is performed to the maximum and reverse normalization is carried outamplitude will be amplified and the power of a partial zone signal will also increase as a result. By this operationthe power loss by bit assignment being zero is compensated by making the power of all the partial zones increase. The loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be beforehand compensated with the encoder side. In shorta zone division means generates a partial zone signal by dividing an input signal into two or more partial zones againA maximum value detecting means detects the maximum of the absolute value of a partial zone signaland it an auditory model meansBased on the masking rule of human being's aural characteristicconduct spectrum analysis of the input signalcompute the valuation function over two or more partial zonesand a bit quota means as bit assignment for quantizing two or more partial zone signalsBased on a valuation functionperform bit assignmentand a quantization means quantizes two or more partial zone signals based on bit assignmentA multiplexing means multiplexes and outputs bit quota informationmaximum detection informationand sample informationFrom the bit assignment by the power and the bit quota means of a partial zone signal which a power loss calculating means is outputted from a zone division meansa power loss when the bit assignment to a partial zone becomes zero is computedand the maximum is adjusted.

[0049]an embodiment of the invention -- the maximum controller 16 in the 8. above-mentioned embodiment 7According to the power loss computed by the power loss calculation part 14it is aimed to compensate the lossand a gain adjustment is performed only to the biggest thing among the maximums to each partial zone detected by the maximum primary detecting element 2. By using this appearanceas the above-mentioned Embodiment 7 explainedthe power loss by bit assignment being zero is compensated by making the power of a partial zone with the biggest maximum increase. A lost part of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be beforehand compensated with the encoder side. In the maximum controller 16the biggest partial zone of the power of a partial zone signal may be chosen as a selection method of the partial zone of the object which performs the gain adjustment of the maximum among each partial zone computed by the power loss calculation part 14. Furthermore in the maximum controller 16it may choose as a selection method of the partial zone of the object which performs the gain adjustment of the maximumjudging

from the valuation function outputted from the auditory model part 3. When a conventional example describes as a valuation function and the difference of the maximum of a signal level and the minimum of the mask characteristic is consideredthe smallest partial zone is chosen. In the above-mentioned examplethe gain adjustment of the maximum may not be performed only only to one partial zonebut it may carry outfor example from a higher rank to N partial zones.

[0050]an embodiment of the invention -- 9. drawing 13 is shown about the encoder which is an example of this invention. In drawing 131-6 are the same as that of the above-mentioned conventional exampleand they omit the explanation. 14 is a power loss calculation part and 15 is a gain adjustment part. Nextoperation is explained.

[0051]In the above-mentioned Embodiments 6-8the power loss calculation part 14 may compute the power of each partial zone signal from spectrum analysis resultssuch as FFT performed in the auditory model part 3 as a calculating method of the power to each partial zone. The explanation is concretely explained based on Embodiment 6. Drawing 13 is shown about the encoder which is an example of this invention.

[0052]Nextoperation processing is explained. The zone dividing part 1the maximum primary detecting element 2the auditory model part 3and the bit assigning part 4 so once process to an input signal. The power loss calculation part 14 computes the sum total of the power of the partial zone whose bit assignment is zero from the bit assignment determined by the spectrum analysis result and the bit assigning part 4 in the auditory model part 3. The gain adjustment part 15 adjusts the gain of an input signal according to the power loss computed by the power loss calculation part 14. The usual processing is performed to the input signal adjusted by this gain adjustment part 15. The loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be compensated beforehand. In the above-mentioned gain adjustment part 15a gain adjustment like Embodiment 7 and Embodiment 8 may be performed.

[0053]an embodiment of the invention -- 10. drawing 14 is shown about the encoder which is an example of this invention. In drawing 141-6 are the same as that of the above-mentioned conventional exampleand they omit the explanation. 14 is a power loss calculation part and 15 is a gain adjustment part. Nextoperation is explained.

[0054]The zone dividing part 1the maximum primary detecting element 2the auditory model part 3and the bit assigning part 4 so once process to an input signal. The power loss calculation part 14 computes the sum total of the power of the partial zone whose bit assignment is zero from the bit assignment determined by the maximum detected in the maximum primary detecting element 2and the bit assigning part 4. The gain adjustment part 15 adjusts the gain of an input signal according to the power loss computed by the power loss calculation part 14. The usual processing is performed to the input signal adjusted by this gain adjustment part 15. The loss of the partial zone signal component by the bit assignment to a partial zone serving as zero by this can be compensated beforehand. In the above-mentioned gain adjustment part 15a gain adjustment like Embodiment 7 and Embodiment 8 may be performed.

[0055]an embodiment of the invention -- 11. drawing 15 is shown about the encoder which is an example of this invention. In drawing 151-6 are the same as that of the above-mentioned conventional exampleand they omit the explanation. As for a local decoding partand 12 and 13a power loss calculation part and 15 are gain adjustment parts the power analyzor and 14 11. Nextoperation is explained.

[0056]In the above-mentioned Embodiments 6-8the power loss calculation part 14 may compute the power of each partial zone signal from the maximum ******(ed) by the maximum primary detecting element 2 as a calculating method of the power to each partial zone. The explanation is concretely explained based on Embodiment 6. Drawing 15 is shown about the encoder which is an example of this invention.
[0057]The local decoding part 11 is the same composition as the decoder shown in a conventional exampleand performs the same operation. The local decoding part 11 inputs the decode data outputted from the multiplexing part 6and outputs a decoded signal. The 1st power analyzor 12 computes the power of the input HARASHIN item inputted into an encoderand the 2nd power analyzor 13 computes the power of the decoded signal outputted from the local decoding part 11. The power loss calculation part 14 computes a power loss from the power analysis result outputted from the 1st power analyzor 12 and the 2nd power analyzor 13. The gain adjustment part 15 performs a gain adjustment according to the power loss outputted from the power loss calculation part 14. By thisa part for a power loss in case bit assignment serves as zero can be beforehand compensated by operating the power of an input signal. In the above-mentioned gain adjustment part 15a gain adjustment like Embodiment 7 and Embodiment 8 may be performed.
[0058]Example 1. drawing 16 is shown about the encoder which is an example of this invention. In drawing 161-6 are the same as that of the above-mentioned conventional exampleand they omit the explanation. 12 is the power analyzor. Nextoperation is explained.
[0059]The power analyzor 12 computes the power of an input HARASHIN itemand outputs the information as power information. In the multiplexing part 6in addition to the bit quota information from the bit assigning part 4the maximum information from the maximum primary detecting element 2and the sample information from the quantizing part 5the power information from the power analyzor 12 is multiplexedand it outputs as coding data.
[0060]an embodiment of the invention -- 12. drawing 17 is shown about the decoder which is an example of this invention. In drawing 1721-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. 15 is a gain adjustment part. Nextoperation is explained.
[0061]The separation part 21 divides coding data into bit quota informationmaximum informationsample informationand power information. Power information here is the power of the input HARASHIN item in an encoder. In the inverse quantization part 22although a partial zone signal is decoded from each previous informationbit assignment cannot decode a partial zone signal about the partial zone which is zerobut a partial zone signal serves as zero. Thereforewhen the partial zone signal exists in an encoder originallythe decoded signal outputted from the band composition part 23 is decreasing by the power of the partial zone signal whose bit assignment is zero. In order to compensate the decrement of this powerthe gain adjustment part 15 performs a gain adjustmentperforming power calculation of the decoded signal outputted from the band composition part 23 so that this power may be in agreement with the power information of the input HARASHIN item in the encoder outputted from a separation part. By thispower of a decoded signal can be made equal to the HARASHIN item. The decoder constituted as mentioned above in shortSeparating mechanism The power information

from input coding databit quota informationSeparate maximum information and sample information and an inverse quantization means Bit quota informationA partial zone signal is decoded from maximum information and sample informationa band composition means carries out band composition of the partial zone signaland a gain-adjustment means outputs by performing the gain adjustment of a decoded signal by which band composition was carried out according to power information.

[0062]an embodiment of the invention -- 13. drawing 18 is shown about the decoder which is an example of this invention. In drawing 1821-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. 14 is a power loss calculation part and 16 is a maximum controller. Nextoperation is explained.

[0063]The separation part 21 divides coding data into bit quota informationmaximum informationsample informationand power information. Power information here is the power of the input HARASHIN item in an encoder. Bit assignment distinguishes first the partial zone which is not zero from this bit quota informationand the power loss calculation part 14 computes the power of a partial zone signal to that partial zone from the maximum information over that partial zone. Nextbit assignment computes the power of the partial zone which is zero from this and the power information from the separation part 21. This power serves as a loss of the power to the HARASHIN item. The maximum controller 16 performs the gain adjustment of the maximum to all the partial zones from the separation part 21 towards compensating the loss according to the power loss computed by the power loss calculation part 14. In the inverse quantization part 22since reverse normalization is performed using this maximum by which the gain adjustment was carried outpower adjustment of the partial zone signal will be carried outand power adjustment also of the decoded signal outputted from the band composition part 23 as a result is carried out. The power of a decoded signal can be compensated by this. In the maximum controller 16a gain adjustment may be carried out only to the biggest thing among the maximum information over the partial zone outputted from the separation part 21.

[0064]Example 2. drawing 19 is shown about the decoder which is an example of this invention. In drawing 1921-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. 14 is a power loss calculation part and 15 is a gain adjustment part. Nextoperation is explained.

[0065]The separation part 21 divides coding data into bit quota informationmaximum informationsample informationand power information. Power information here is the power of the input HARASHIN item in an encoder. The power loss calculation part 14 computes the power of the partial zone signal outputted from the inverse quantization part 22. In this inverse quantization part 22the partial zone signal of the partial zone whose bit assignment is zero is not decodedbut when it comes and that partial zone signal exists in an encoderthe decoded signal outputted from the band composition part 23 is decreasing by the power of the partial zone signal whose bit assignment is zero. In order to compensate the decrement of this powera power loss is computed from the power of a partial zone signal and the power information from the separation part 21 which are outputted from the inverse quantization part 22 computed previously. The gain adjustment part 15 performs the gain adjustment of the partial zone signal outputted from the inverse quantization part 22 according to the power loss computed by the power loss calculation part 14. As for the decoded signal outputted from the band composition part

23 as a resultpower will be adjusted. The power of a decoded signal can be compensated by this. A gain adjustment may be performed to the decoded signal after band composition.

[0066]an embodiment of the invention -- 14. drawing 20 is shown about the decoder which is an example of this invention. In drawing 2021-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. 24 is a partial zone signal generating partand 25 is an adder unit. Nextoperation is explained.

[0067]The partial zone signal generating part 24 distinguishes the partial zone whose bit assignment is zero from the bit quota information first outputted from the separation part 21. Nextthe alternative signal over the partial zone is generated. White noise is generated as this alternative signal. At this timethe level of an alternative signal is made equal to the level of lower limit of hearing. This level means the power level of a partial zone signal. This lower limit of hearing is a limit which can be perceived by human being's acoustic senseand if a level is set as this appearancethis alternative signal component will not be perceived even after band composition. In the adder unit 25the partial zone signal decoded by the inverse quantization part 22 as shown in drawing 21and the partial zone signal generated by the partial zone signal generating part are added. The partial zone signal over all the partial zones is inputted into the band composition part 23 by this addition. In the band composition part 23each partial zone signal outputted from the adder unit 25 is compoundedand the decoded signal of the original bandwidth is outputted. The power of a decoded signal can be compensated by this.

[0068]an embodiment of the invention -- 15. drawing 22 is shown about the decoder which is an example of this invention. In drawing 2221-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. 24 is a partial zone signal generating partand 25 is an adder unit. Nextoperation is explained.

[0069]The partial zone signal generating part 24 distinguishes the partial zone whose bit assignment is zero from the bit quota information first outputted from the separation part 21. Nextthe alternative signal over the partial zone is generated. White noise is generated as this alternative signal. At this timethe level of an alternative signal is specified as follows. Bit assignment distinguishes the partial zone which is zeroand the partial zone which is not zero from the bit quota information outputted from the separation part 21. Nextbit assignment computesusing maximum information as a signal level of the partial zone which is not zero. As a signal level of the partial zone whose bit assignment is zerosince maximum information does not existit asks as follows. The sound to which the partial zone signal of the partial zone whose bit assignment is not zero is made for other sounds as used in the field of a masking effect not to be heard as shown in drawing 23That isit is regarded as a masker and the bit assignment for which it asked previously calculates the masking threshold of the partial zone whose bit assignment is zero from the signal level of the partial zone which is not zero. Let this masking threshold be a level of an alternative signal. Thussetting out of a level will not perceive this alternative signal component even after band composition. In the adder unit 25the partial zone signal decoded by the inverse quantization part 22 and the partial zone signal generated by the partial zone signal generating part are added as Embodiment 14 described. The partial zone signal over all the partial zones is inputted into the band composition part 23 by this addition. In the band composition part 23each partial zone signal outputted from the adder unit 25 is compoundedand the decoded signal of the original bandwidth is

outputted. The power of a decoded signal can be compensated by this. The above-mentioned bit assignment may ask as a method of asking for the signal level of the partial zone which is not zerofrom the decoded partial zone signal which is outputted from the inverse quantization part 22.

[0070]an embodiment of the invention -- 16. drawing 24 is shown about the decoder which is an example of this invention. In drawing 2421-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. As for 24an adder unit and 26 are level information storage parts stores a partial zone signal generating part and 25. Nextoperation is explained.

[0071]The level information storage parts store 26 memorizes the level information of each partial zone signal in the frame concerned outputted from the adder unit 25and outputs the level information of each partial zone signal in the past frame. The partial zone signal generating part 24 distinguishes the partial zone whose bit assignment is zero from the bit quota information first outputted from the separation part 21. Nextthe alternative signal over the partial zone is generated. White noise is generated as this alternative signal. At this timethe level of an alternative signal is specified as follows. For examplethe level information of a frame just before receiving each partial zone memorized by the level information storage parts store 26 is applied as it is. Or the level value predicted from transition of the level information of two or more frames of the past of each partial zone memorized by the level information storage parts store 26 is applied. For exampleif the level information for two last frames is an upward tendencyit will carry out by 1.2 times the just before level informationand if it is a downward tendencyit may be 0.8 last time. In the adder unit 25the partial zone signal decoded by the inverse quantization part 22 and the partial zone signal generated by the partial zone signal generating part are added as the above-mentioned embodiment described. The partial zone signal over all the partial zones is inputted into the band composition part 23 by this addition. In the band composition part 23each partial zone signal outputted from the adder unit 25 is compoundedand the decoded signal of the original bandwidth is outputted. The power of a decoded signal can be compensated by this.

[0072]an embodiment of the invention -- 17. drawing 22 is shown about the decoder which is an example of this invention. In drawing 2221-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. 24 is a partial zone signal generating partand 25 is an adder unit. Nextoperation is explained.

[0073]The maximum information over each partial zone separated by the separation part 21 assumes that the maximum to all the partial zones is always included irrespective of whether the bit assignment to each partial zone is zeroor it is not zero. The partial zone signal generating part 24 distinguishes the partial zone whose bit assignment is zero from the bit quota information first outputted from the separation part 21. Nextthe alternative signal over the partial zone is generated. White noise is generated as this alternative signal. At this timethe level of an alternative signal is specified as follows. A signal level is computed from the maximum to this partial zoneand that level is applied. In the adder unit 25the partial zone signal decoded by the inverse quantization part 22 and the partial zone signal generated by the partial zone signal generating part are added as the above-mentioned embodiment described. The partial zone signal over all the partial zones is inputted into the band composition part 23 by this addition. In the band composition part 23each partial zone signal outputted from the adder unit 25 is compoundedand the

decoded signal of the original bandwidth is outputted. The power of a decoded signal can be compensated by this.

[0074]an embodiment of the invention -- 18. drawing 25 is shown about the decoder which is an example of this invention. In drawing 2521-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. As for 24an adder unit and 26 are partial zone signal storage parts a partial zone signal generating part and 25. Nextoperation is explained.

[0075]The partial zone signal storage part 26 memorizes each partial zone signal in the frame concerned outputted from the adder unit 25and outputs each partial zone signal of the past frame. The partial zone signal generating part 24 distinguishes the partial zone whose bit assignment is zero from the bit quota information first outputted from the separation part 21. Nextthe alternative signal over the partial zone is generated. The partial zone signal of the previous frame outputted from the partial zone signal storage part 26 is used as this alternative signal. At this timethat level is defined as the above-mentioned Embodiments 14-17. In the adder unit 25the partial zone signal decoded by the inverse quantization part 2 and the partial zone signal generated by the partial zone signal generating part are added as the above-mentioned Embodiment 17 described. The partial zone signal over all the partial zones is inputted into the band composition part 23 by this addition. In the band composition part 23each partial zone signal outputted from the adder unit 25 is compoundedand the decoded signal of the original bandwidth is outputted. The power of a decoded signal can be compensated maintaining the quality of a decoded signal by this.

[0076]an embodiment of the invention -- 19. drawing 26 is shown about the decoder which is an example of this invention. In drawing 2621-23 are the same as that of the above-mentioned conventional exampleand omit the explanation. 24 is a partial zone signal generating partand 25 is an adder unit. Nextoperation is explained.

[0077]The partial zone signal generating part 24 distinguishes the partial zone whose bit assignment is zero from the bit quota information first outputted from the separation part 21. Nextthe alternative signal over the partial zone is generated. The signal generated as follows is used as this alternative signal. Bit assignment considers that the frequency which represents that partial zone in the partial zone which is zerofor examplecenter frequencyis fundamental frequencyand generates a composite signal from the partial zone signal of the partial zone containing the harmonics and the subharmonic to this fundamental frequency. As a selection method of the partial zone which contains harmonics and a subharmonic hereFor exampleor it chooses the partial zone containing the harmonics and the subharmonic up to the n-th orderwhen fundamental frequency is lowthe harmonics up to the n-th order are chosenor when fundamental frequency is highthere is the method of choosing the partial zone containing the subharmonic up to the n-th order. Thusthe level of the generated composite signal is defined as the above-mentioned Embodiments 14-17. In the adder unit 25the partial zone signal decoded by the inverse quantization part 22 and the partial zone signal generated by the partial zone signal generating part are added. The partial zone signal over all the partial zones is inputted into the band composition part 23 by this addition. In the band composition part 23each partial zone signal outputted from the adder unit 25 is compoundedand the decoded signal of the original bandwidth is outputted. The power of a decoded signal can be compensated maintaining the quality of a decoded signal by this. The partial zone

signal which adjoins the partial zone which it is going to generate as a method of generating a composite signal may be compounded and generated from other above partial zone signals.

[0078]

[Effect of the Invention]In this inventionit is possible to provide the coding decryption machine which acquires numerals without a signal power loss and a decoded signal from the HARASHIN item as mentioned above.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a block diagram showing the composition of the encoder in Embodiment 1.

[Drawing 2]It is a figure showing the memory state of the bit assignment table in Embodiments 1 thru/or 4.

[Drawing 3]It is a figure showing the memory state of the bit assignment table in Embodiments 1 thru/or 4.

[Drawing 4]It is a figure showing the state of the partial zone signal in Embodiments 1 thru/or 4.

[Drawing 5]It is a block diagram showing the composition of the encoder in Embodiment 2.

[Drawing 6]It is a block diagram showing the composition of the encoder in Embodiment 3.

[Drawing 7]It is a block diagram showing the composition of the encoder in Embodiment 4.

[Drawing 8]It is a block diagram showing the composition of the encoder in Embodiment 5.

[Drawing 9]It is a block diagram showing the composition of the encoder in Embodiment 6.

[Drawing 10]It is a constitutional diagram of the partial zone signal of Embodiment 6.

[Drawing 11]It is a block diagram showing the composition of the encoder of Embodiment 7.

[Drawing 12]It is a constitutional diagram of the partial zone signal of Embodiment 7.

[Drawing 13]It is a block diagram showing the composition of the encoder in Embodiment 9.

[Drawing 14]It is a block diagram showing the composition of the encoder in Embodiment 10.

[Drawing 15]It is a block diagram showing the composition of the encoder in Embodiment 11.

[Drawing 16]It is a block diagram showing the composition of the encoder in Example 1.

[Drawing 17]It is a block diagram showing the composition of the decoder in Embodiment 12.

[Drawing 18]It is a block diagram showing the composition of the decoder in Embodiment 13.

[Drawing 19]It is a block diagram showing the composition of the decoder in Example 2.

[Drawing 20]It is a block diagram showing the composition of the decoder in Embodiment 14.
[Drawing 21]It is a constitutional diagram of the partial zone signal in Embodiment 14.
[Drawing 22]It is a block diagram showing the composition of the decoder in Embodiment 15.
[Drawing 23]It is a constitutional diagram of the partial zone signal in Embodiment 15.
[Drawing 24]It is a block diagram showing the composition of the decoder in Embodiment 16.
[Drawing 25]It is a block diagram showing the composition of the decoder in Embodiment 17.
[Drawing 26]It is a block diagram showing the composition of the decoder in Embodiment 18.
[Drawing 27]It is a block diagram showing the composition of the encoder in a conventional example.
[Drawing 28]It is a figure showing the power analysis state of the input signal in a conventional example.
[Drawing 29]It is a figure showing the state of the bit assignment in a conventional example.
[Drawing 30]It is a figure showing the power analysis state of the partial zone signal in a conventional example.
[Drawing 31]It is a block diagram showing the composition of the decoder in a conventional example.
[Description of Notations]
1 A zone division means and 2 A maximum value detecting means3 auditory model meansand 4 Bit quota means5 A quantization means and 6 A multiplexing means8 reference-bit quota table9 A reference bit quota means and 10 A power calculating means and 11 Local decoding meansThe 12 1st power tools of analysis and 13 The 2nd power tools of analysis and 14 Power loss calculating means15 A gain-adjustment means and 16 [ A band composition means and 24 / A partial zone signal generating means and 25 / An adder unit26 level-information storage parts storeand 27 / Partial zone signal storage part. ] A maximum adjustment device and 21 Separating mechanism and 22 An inverse quantization means and 23